Probing the cellular uptake and response of porphyrinic photosensitizers in polymeric nanoparticles by fluorescence measurements and ^{1}H HR-MAS NMR based metabolic profiling of HeLa cells

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Polymer-based nanoparticles are considered as suitable drug delivery vehicles for porphyrinic photosensitizers in photodynamic therapy (PDT) since they enhance porphyrin stability and prevent porphyrin self-association in aqueous solutions [1]. Previously, we have shown by ^{1}H NMR spectroscopy that the photosensitizer serine-chlorin e6 (SerCE) is disaggregated upon insertion into either the polymer polyvinylpyrrolidone (PVP) or into polymer micelles consisting of Kolliphor P188 (KP188) [2, 3].

The aim of the current study was to probe and compare the impact of the carrier systems, i.e. PVP and KP188, on the cellular uptake of SerCE and on the cellular response towards SerCE treatment in the dark. For this, fluorescence detection using the ImageStream system and ^{1}H High Resolution Magic Angle Spinning (HR-MAS) NMR spectroscopy combined with multivariate statistical analysis were applied. The HR-MAS technique allows detection of small compounds in semi-solid material such as live cells. Monitoring of the small metabolites in HeLa cells after incubation with SerCE and PVP as transport vehicle showed alterations especially in metabolites derived from lipid components. Uptake of SerCE into HeLa cells was tested using the ImageStream system. The fluorescence data indicated that the uptake was decreased if Kolliphor P188 was present together with SerCE compared to SerCE alone. The results will be compared to the corresponding data obtained with KP188 (by HR-MAS NMR) and PVP (by ImageStream) in order to assess their properties and suitability as delivery vehicle for chlorin e6 based photosensitizers in PDT.

[1] C. Conte, S. Maiolino, D. S. Pellosi, A. Miro, F. Ungaro, F. Quaglia, *Top. Curr. Chem.* **2016**, 370, 61-112.
[2] M. Hädener, I. Gjuroski, J. Furrer, M. Vermathen, *J. Phys. Chem. B*, **2015**, 119, 12117-12128.
[3] I. Gjuroski, J. Furrer, M. Vermathen *Chimia*, **2015**, 69 (S 7-8), MC-151.